II. Remarks

Claims 1-3, 6-8 and 10 are cancelled herein. Claims 9, 11, 12, 13, 14, 15, 16, 18, 19, 20 and 21 are amended herein. New claim 22 is added herein. Claims 9, 11-16 and 18-22 now remain pending herein. Support for the various amendments made to the claims herein may be found throughout the application as filed.

On May 5, 2009, an Office Action (hereafter "Office Action") was mailed rejecting all of the then-pending claims on the basis of U.S. Patent No. 5,329,111 to Sonoda et al., U.S. Patent No. 5,502,488 to Nagasaki et al., U.S. Patent No. 5,508,507 to Nelson et al., U.S. Patent No. 5,633,679 to Hosier and U.S. Patent No. 3,737,571 to Gaebele et al.

On August 7, 2009, the Examiner and the applicants' attorney conducted a telephone interview and discussed the remaining claims substantially as they are amended herein. The Examiner agreed that the amendments made to the claims overcame the references cited in the Section 103 rejections made in the May 5 Office Action.

The present Response and Amendment are submitted herewith in response to the Office Action, and to follow up on the telephone interview.

III. Rejections and Objections of Claims Made in the Office Action

In the Office Action, the Examiner objected to and rejected claims on the following bases:

(1) Claims 1-3, 6-16 and 18-21 were objected to because of various informalities;

(2) Claims 2, 3, and 11-12 were rejected under 35 U.S.C. Section 112, second paragraph as being indefinite;

(3) Claims 1, 6-10, 13-16 and 18-21 were rejected under 35 U.S.C. Section 103(a) as being unpatentable over U.S. Patent No. 5,329,111 to Sonoda et al. (hereinafter "the Sonoda reference") in view of U.S. Patent No. 5,633,679 to Hosier et al. (hereinafter "the Hosier reference") further in view of U.S. Patent No. 3,737,571 to Gaebele et al. (hereinafter "the Gaebele reference"); and

(4) Claims 2-3 and 11-12 were rejected under 35 U.S.C. 103(a) as being unpatentable over the Sonoda and Hosier references in view of the Gaebele reference further in view of U.S. Patent No. 5,502,488 to Nagasaki et al. (hereinafter "the Nagasaki reference") and U.S. Patent No. 5,508,507 to Nelson et al. (hereinafter "the Nelson reference").

Each of the foregoing objections and rejections is responded to below, where each response references the number corresponding to each rejection set forth above.

IV. Responses to Objection and Rejections Made in the Office Action

(1) The objections to claims 1-3, 6-16 and 18-21 are overcome by way of claim cancellations and amendments made herein.

The objections to claims 1-3, 6-16 and 18-21 are overcome by way of claim cancellations and amendments made herein.

(2) Claims 2, 3, 11 and 12 are cancelled or amended to overcome the rejections made under 35 U.S.C. 112, second paragraph.

In rejecting claims 2, 3, 11 and 12 as being indefinite under 35 U.S.C. 112, second paragraph, the Examiner stated:

> Claim 2 (lines 6, 8, 12) recites limitation "said negative input", it is not known this limitation refers to the limitation "a negative input" as claimed in claim 1 (lines 21-22) or the limitation "a negative input" as claimed in claim 2 (line 4).
>
> Claim 2 (line 7) recites limitation "said feedback resistor", it is not known this limitation refers to the limitation "a feedback resistor" as claimed in claim 1 (line 22) or the limitation "a feedback resistor" as claimed in claim 2 (line 5).
>
> Claim 2 (line 11) recites limitation "said positive input", it is not known this limitation refers to the limitation "a positive input" as claimed in claim 1 (line 21) or the limitation "a positive input" as claimed in claim 2 (line 4).
>
> Claim 3 (lines 6, 8, 12) recites limitation "said negative input", it is not known this limitation refers to the limitation "a negative input" as claimed in claim 1 (lines 21-22) or the limitation "a negative input" as claimed in claim 3 (line 4).
>
> Claim 3 (line 7) recites limitation "said feedback resistor", it is not known this limitation refers to the limitation "a feedback resistor" as claimed in claim 1 (line 22) or the limitation "a feedback resistor" as claimed in claim 3 (line 5).
>
> Claim 3 (line 11) recites limitation "said positive input", it is not known this limitation refers to the limitation "a positive input" as claimed in claim 1 (line 21) or the limitation "a positive input" as claimed in claim 3 (line 4).
>
> Claim 3 (line 10) recites the limitation "said" in "said dark current". There is insufficient antecedent basis for this limitation in the claim.

Claim 11 (lines 6, 8, 12) recites limitation "said negative input", it is not known this limitation refers to the limitation "a negative input" as claimed in claim 9 (line 25) or the limitation "a negative input" as claimed in claim 11 (line 4).

Claim 11 (line 7) recites limitation "said feedback resistor", it is not known this limitation refers to the limitation "a feedback resistor" as claimed in claim 9 (line 25) or the limitation "a feedback resistor" as claimed in claim 11 (line 5).

Claim 11 (line 10) recites the limitation "said" in "said color component". There is insufficient antecedent basis for this limitation in the claim.

Claim 11 (line 11), recites limitation "said positive input", it is not known this limitation refers to the limitation "a positive input" as claimed in claim 9 (line 24) or the limitation "a positive input" as claimed in claim 11 (line 4).

Claim 12 (lines 5, 7, 11) recites limitation "said negative input", it is not known this limitation refers to the limitation "a negative input" as claimed in claim 9 (line 25) or the limitation "a negative input" as claimed in claim 12 (line 3).

Claim 12 (line 6) recites limitation "said feedback resistor", it is not known this limitation refers to the limitation "a feedback resistor" as claimed in claim 9 (line 25) or the limitation "a feedback resistor" as claimed in claim 12 (line 4).

Claim 12 (line 10) recites limitation "said positive input", it is not known this limitation refers to the limitation "a positive input" as claimed in claim 9 (line 24) or the limitation "a positive input" as claimed in claim 12 (line 3).

The rejections of claims 2, 3, 11 and 12 under Section 112 are overcome by way of the claim cancellations and amendments made herein.

(3) Claims 9, 10, 13-16 and 18-21 as amended herein are not unpatentable over the Sonoda reference in view of the Hosier reference further in view of the Gaebele reference under 35 U.S.C. Section 103(a).

In rejecting claims 1, 6-10, 13-16 and 18-21 as being unpatentable over the Sonoda, Hosier and Gaebele references, the Examiner stated:

> Regarding claim 1, Sonoda et al. discloses a color component color sensing circuit, comprising:
>
> a color sensor circuit comprising a first photodetector configured to receive incident light falling thereon, and to provide, in response to the incident light falling thereon, a first light photocurrent therefrom as a first output voltage, the first output voltage corresponding to an intensity of one of a Red Green and Blue component of the incident light as such intensity occurs under operating temperatures (Sonoda et al. discloses output voltages corresponding to color signals R, G, B are outputted from image sensor 1 via amplifiers 2, 3, 4, and entered differential amplification circuits 8, 9, 10 via resistors 8d, 9d, 10d; which occurs at a temperature of surrounding area or environment such as a room temperature, figure 7, column 1, lines 10-67);
>
> a differential amplifier circuit (differential amplification circuit 8, figure 7, column 1, lines 10-67) operably coupled to said color sensor circuit and to said dark color sensor circuit, said differential amplifier circuit being configured to receive said first and second output voltages, remove, using said second output voltage, said dark color offset voltage from said first output voltage, and thereby provide a dark color offset voltage and current operating temperature compensated output signal to a differential output thereof representative of said intensity of said color component;
>
> a difference amplifier (differential amplifier 8a, figure 7, column 1, lines 10-67) configured to provide said compensated output signal to said differential output and further comprising a positive input, and a negative input;
>
> a feedback resistor (resistor 8b, figure 7, column 1, lines 47-67) having a resistor value with one end coupled to said

negative input and another end coupled to said differential output;

a first resistor (resistor 8d, figure 7) having said resistor value coupled in series with a color sensor output configured to provide said first output voltage and said negative input;

a second resistor (resistor, 8c, figure 7) having said resistor value coupled in series with a dark sensor output of said dark sensor circuit configured to provide said second output voltage and said positive voltage;

a third resistor (resistor 8e, figure 7) having said resistor value coupled in series to said positive input and to ground.

Sonoda et al. fails to specifically disclose a dark color sensor circuit comprising a second photodetector configured to detect and provide a dark second photocurrent proportional to said current operating temperatures and output a second output voltage corresponding to an offset voltage generated by said ark second photocurrent under current operating temperatures. However, Hosier discloses an image sensor array 10, which comprises dark photosensor 15d which establish a reset voltage or offset signal by which all of the active photosensors 15 can be calibrated (figures 1, 2, column 3, line 32 - column 4, line 29). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device Sonoda et al. by the teaching of Hosier in order to provide an image sensor array includes dark photosensors, which are used periodically reset the offset voltage for the photosensors (column 1, lines 59-65).

Sonoda et al. and Hosier et al. fail to specifically disclose said resistor value approximating a resistance of the feedback resistor in said color sensor circuit (i.e., Sonoda et al. fails to disclose the resistor value of each resistor 8d, 8c, 8e is approximated the resistance of the feedback resistor 8b, figure 7). However, Gaebele et al. discloses an automatic dark current control, in which the value of resistors 60, 61, 63 and feedback resistor 65 are equal, thereby making comparator 40 a unity gain amplifier (figure 3, column 3, lines 50-60). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device Sonoda et al. and Hosier by the teaching of Gaebele in order to provide a unity gain different amplifier for a color sensing circuit (column 3, lines 55-60).

Regarding claims 6, 13, 19, Sonoda et al. discloses wherein said color component comprises red (figures 6-7, column 1, lines 10-67).

Regarding claims 7, 14, 20, Sonoda et al. discloses wherein said color component comprises green (figures 6-7, column 1, lines 10-67).

Regarding claims 8, 15, 21, Sonoda et al. discloses wherein said color component comprises blue (figures 6-7, column 1, lines 10-67).

Regarding claims 9, 10, Sonoda et al. discloses a color sensing circuit configured to senses a plurality components of light incident thereon, comprising:

a plurality of Red, Green and Blue color sensor circuits, each color sensor circuit comprising a first photodetector and being configured to receive incident light falling thereon, and to provide, in response to the incident light falling thereon, a first light photocurrent therefrom as a first output voltage, the first output voltage corresponding to one of Red, Green and Blue color component of the incident light as such intensity occurs under current operating temperatures (voltage indicating intensity of R color signal outputted from amplifier 2 and entered differential amplification circuit 8; voltage indicating intensity of G color signal outputted from amplifier 3 and entered differential amplification circuit 9; voltage indicating intensity of B color signal outputted from amplifier 4 and entered differential amplification circuit 10; the image sensor 1 output these output voltages at a temperature of surrounding area or environment such as a room temperature, figure 7, column 1, lines 10-67);

at least one differential amplifier circuit (differential amplification circuit 8, figure 7, column 1, lines 10-67) operably coupled to said plurality of color sensor circuits and to said dark color sensor circuit and being configured to receive said first and second output voltages, remove, using said second output voltage, said dark color offset voltage from each of said first output voltages, and provide dark color offset voltage and current operating temperature compensated output signals corresponding to each of said color components to at least one differential output thereof, each of said output signals representing said intensity of said color component corresponding thereto;

a difference amplifier (differential amplifier 8a, figure 7, column 1, lines 10-67) configured to provide said compensated output signal to said differential output and further comprising a positive input, and a negative input;

a feedback resistor (resistor 8b, figure 7, column 1, lines 47-67) having a resistor value with one end coupled to said negative input and another end coupled to said differential output;

a first resistor (resistor 8d, figure 7) having said resistor value coupled in series with a color sensor output configured to provide said first output voltage and said negative input;

a second resistor (resistor 8c, figure 7) having said resistor value coupled in series with a dark sensor output of said dark sensor circuit configured to provide said second output voltage and said positive voltage;

a third resistor (resistor 8e, figure 7) having said resistor value coupled in series to said positive input and to ground.

Sonoda et al. fails to specifically disclose a dark color sensor circuit comprising a second photodetector configured to provide a dark second photocurrent proportional to said current operating temperatures and output a second output voltage corresponding to an offset voltage generated by said dark second photocurrent under current operating temperatures. However, Hosier discloses an image sensor array 10, which comprises dark photosensor 15d which establish a reset voltage or offset signal by which all of the active photosensors 15 can be calibrated (figures 1, 2, column 3, line 32 - column 4, line 29). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device Sonoda et al. by the teaching of Hosier in order to provide an image sensor array includes dark photosensors, which are used periodically reset the offset voltage for the photosensors (column 1, lines 59-65).

Sonoda et al. and Hosier et al. fail to specifically disclose said resistor value approximating a resistance of the feedback resistor in said color sensor circuit (i.e., Sonoda et al. fails to disclose the resistor value of each resistor 8d, 8c, 8e is approximated the resistance of the feedback resistor 8b, figure 7). However, Gaebele et al. discloses an automatic dark current control, in which the value of resistors 60, 61, 63 and feedback resistor 65 are equal, thereby making comparator 40 a unity gain

amplifier (figure 3, column 3, lines 50-60). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device Sonoda et al. and Hosier by the teaching of Gaebele in order to provide a unity gain different amplifier for a color sensing circuit (column 3, lines 55-60).

As for claim 16, claim 16 is a method claim of apparatus claim 1. Therefore, see Examiner's comments regarding claim 1.

As for claim 18, see Examiner's comments regarding claim 9.

Claims 1 and 6-8 are cancelled herein, thereby rendering moot the rejection of such claims under Section 103.

As the Examiner stated during the interview, the rejections of claims 9, 10, 13-16 and 18-21 are overcome by way of the amendments made herein. The amendments made to claims 9, 10, 13-16 and 18-21 (and new claim 22) result in subject matter being recited that is nowhere to be found in, and that is not obvious in view of any combination of elements disclosed in, the Sonoda, Hosier and Gaebele references.

(D) Claims 11-12 as amended herein are not unpatentable over the Sonoda and Hosier references in view of the Gaebele reference further in view of the Nagasaki and Nelson references under 35 U.S.C. 103(a).

In rejecting claims 2, 3, 11 and 12 as being unpatentable over the Sonoda and Hosier references in view of the Gaebele reference further in view of the Nagasaki and Nelson references, the Examiner stated:

> Regarding claims 2-3, 11-12, Sonoda et al, Hosier et al. and Gaebele et al. fail to specifically disclose a sensor circuit comprises:
>
> a transimpedance amplifier including an output configured to provide said first output voltage, a negative input, and a positive input;
>
> a feedback resistor with one end coupled to said output and another end coupled to said negative input;
>
> a photodetector configured to detect said photocurrent of said color component and comprising a photodetector input coupled to ground and to said positive input, and photodetector output coupled to said negative input.
>
> However, Nagasaki et al. discloses a circuit of one pixel of a solid-state imaging device which comprises photodiode 8, the output of the photodiode 8 coupled to the negative input of amplifier 11, the input of the photodiode 8 coupled to ground; the positive input of amplifier 11 coupled to ground; the amplifier 11 includes a feedback resistor (figure 16, column 6, lines 39-45). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device in Sonoda et al., Hosier et al. and Gaebele et al. by the teaching of Nagasaki et al. in order to provide a current-voltage converting circuit, which assures sufficient output voltage.
>
> Sonoda et al, Hosier et al., Gaebele et al. and Nagasaki et al. fail to specifically disclose a compensation capacitor coupled in parallel with said feedback resistor to said output and said negative input. However, Nelson et al. teaches a combination circuit 51, which includes a compensation capacitor 56, a feedback resistor 54 and operational amplifier 52 (figure 3,

> column 11, lines 27-36). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device in Sonoda et al., Hosier et al., Gaebele et al. and Nagasaki et al. by the teaching of Nelson et al. in order to provide a transimpedance amplifier which results in a conversion of current pulse into a corresponding voltage pulse (column 11, lines 27-36).

Claims 2 and 3 are cancelled herein, thereby rendering moot the rejection of such claims under Section 103.

As the Examiner stated during the interview, the rejections of claims 11 and 12 are overcome by way of the amendments made herein. The amendments made to claims 11 and 12 result in subject matter being recited that is nowhere to be found in, and that is not obvious in view of any combination of elements disclosed in, the Sonoda, Hosier, Gaebele, Nagasaki and Nelson references.

V. Summary

Claims 9, 11-16 and 18-22 as amended herein remain pending in the present application, and are believed to be in condition for allowance. Examination of the application as amended is requested. The Examiner is respectfully requested to contact the undersigned by telephone or e-mail with any questions or comments he may have.

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Date: Aug. 7, 2007

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